Lesson 49 - The Organic Garden; Avoiding Commercially Produced Foods - Why?

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1. Organic Gardening Is The Counter-Part Of Natural Hygiene

Organic gardening, or planned growing without poisons, is the best way to produce flavorful food that will build healthy bodies. The procedures in organic gardening utilize the concept of the cycle of plant life in a virgin forest—birth, life, death, and return to the earth for decomposition and enrichment of the soil for the ensuing cycles. The preservation of the ecological system in your garden can be a big factor in preserving the eco system in your own body.

Organic gardening is the counterpart of Natural Hygiene—it is a system of growing healthy plants in cooperation with nature by utilizing only naturally occurring materials for improving the soil and fertilizing, and for combating insect or disease problems.

They both, organic gardening and Natural Hygiene, work the same way—if you provide the body with the best possible conditions for optimal health, you can avoid disease; if you provide your garden with the best possible conditions for growing healthy plants, if you work *with* nature instead of *against* it, if you *maintain* the balance of nature instead of *destroying* it, you can anticipate success. You will harvest a bountiful crop of food of excellent flavor, high nutritional value, and free of residues of chemical

fertilizers and poison sprays.

In the 1980s there is increasing interest in organic gardening because of its impact in the solution of environmental problems, and the growing awareness of the important role of organic food in the improvement of health.

2. What Exactly Is Organically-Grown Food?

Organic gardening has been traditional in European countries for many years, but, by the 1940s, farmers and gardeners in the United States had gotten farther and farther away from earlier growing methods, and chemicalization had begun to prevail. About that time, a significant organic-gardening movement was pioneered by J. I. Rodale, of Emmaus, Pennsylvania, founder of *Organic Gardening and Farming magazine*. Since then, many of his followers have produced fruits and vegetables of extraordinary quality.

J.I. Rodale worked on many public projects in opposition to pesticides and drug cartels, made a significant contribution to agricultural sciences, and helped establish "organic" as a household word.

The Rodale organization formulated a scientifically-sound definition of organically-grown food which is today accepted as bona fide by most leaders of the natural, organic movement, and by officials of the U.S. Department of Agriculture.

The following is the official definition: *Organically-grown food is food grown without pesticides; grown without artificial fertilizers; grown in soil whose humus content is increased with applications of natural mineral fertilizers; and has not been treated with preservatives, hormones, antibiotics, etc.*

3. Soil Analysis

Many advocates of organic gardening will tell you that the first step is to have your soil analyzed to determine what elements are missing, and to determine its pH—that is, the degree of its acidity (sourness) or alkalinity (sweetness), because the pH has a relationship to the ability of the soil to support the growth of various plants. (pH is a chemical symbol denoting the concentration of hydrogen ions per liter.) You might decide to bypass this step.

On a scale of 0 to 14, pH values from 0 to 7 indicate acidity; values from 7 to 14 indicate alkalinity; pH 7, the value of pure water, is regarded as neutral. Soil in most low rainfall areas tend to be alkaline; soil in high rainfall areas are usually somewhat acid.

The continual addition of organic material to the soil generally provides the necessary elements for plant nutrition, and tends to stabilize the pH, with the result that vegetables with a variety of pH preferences can be grown together successfully. Most vegetables prefer soils that are neutral or slightly acid (pH 6.5). See chart of pH preferences in supplementary section of this lesson.

A slightly-acid soil is best for availability of nutrients. I) the soil is too acid, calcium, magnesium, and phosphorus levels decrease, and manganese and aluminum may be too available, even toxic. The pH of a very acid soil can be raised by adding dolomite lime. In alkaline soils over pH 7.5, iron, copper, manganese, zinc, and phosphates may become less available. Organic matter is the best remedy for such very alkaline soils. Humus or organic matter tends to neutralize either overly-acid or overly-alkaline soils.

For simple pH readings, you can test your soil with a kit. If serious problems persist, professional soil analysis can point out sources of trouble. Most gardeners discover what will grow well in their soil by observation and trial-and-error.

4. Basic Steps To Establish A Successful Garden

There are many ways to go about producing a living soil, containing all the known and unknown minerals, and billions of microorganisms. If the soil in your garden has been misused by pollution with chemical fertilizers, pesticides and herbicides, or by depletion of its organic matter without recycling anything back into the soil, it will take more heroic measures, and a longer period of time, to bring the system back into balance.

A virgin soil may have also been damaged. It may have been "robbed" of its topsoil by builders and graders, or decreased in value by mixture with the subsoil. The surface soil, or topsoil, usually is the top eight to fourteen inches of the soil, and is darker and more fertile than the subsoil. In any event, a new garden hasn't had time to build up a deep friable (readily crumbled) soil full of nutrients and microorganisms. But you can still have a successful first year crop, if you follow a few simple steps. There are three basic steps for growing plants successfully:

1. Produce a living soil, light and crumbly, granular, water retentive, and containing all the substances necessary to plant life. It must contain organic matter, living organisms, the proper soil "atmosphere," moisture, and nutrients for growth of plants and microorganisms. There are three basic soil types: clay, sand, and loam. Clay takes in water slowly, drainage is very low, and aeration is limited. Plant roots have a difficult time penetrating clay soil. Gypsum and lime can improve aeration and drainage of clay soils. Organic matter will improve air circulation (compost, ground bark, sawdust, leaf mold, peat moss).

   Sandy soils have the opposite problem—it lets in plenty of oxygen, and roots pass through easily. It has good drainage—too good!—the water and water soluble nutrients pass through too quickly. Add a finely-textured, spongy, organic material that will hold water and nutrients. Peat moss is such a material, and it has the advantage of slow decomposition, but it contains practically no nutrients. (Also, large amounts of peat moss may increase the acidity of the soil.) Compost breaks down faster, but supplies nutrients to the soil. Wood products and hulls are not much benefit to sandy soils. If you obtain clay to add to your sandy soil, this will help to create a balance.

   The addition of these and other organic materials will eventually change the sandy soil into good garden loam, containing a balance of different sizes of particles, and a good supply of humus (a dark sticky substance created by decomposition of organic materials). This loam will be loaded with valuable nutrients and capable of producing healthy vigorous food plants.

Loam is the ideal soil. Few gardeners are blessed with a naturally-loamy soil, but it can be gradually built almost anywhere.

2. Keep the soil in your vegetable garden and under your fruit trees covered at all times with approximately six inches of organic mulch. The mulch for gardens and vines should range in height from three to six inches, fruit trees from six to nine inches.
3. Supply adequate moisture. A deep watering once or twice a week is far preferable to a light watering every day. Light rain showers of less than one-half inch should not interrupt the regular water schedule. Shallow water encourages the roots to turn upwards towards the moisture and may kill the plants. Deep watering, encourages a deep, strong root system. Do your watering in the early morning or late evening. Do not overwater your garden or trees—it is not necessary to water every day.

Because it is often high in sodium, artificially-softened water should not be used. The leaf-tips of many plants turn brown from artificially-fluoridated water, or from water with a high natural fluorine content.

4.1 Getting Started

Clean out the grass and weeds in your garden area and do some digging to loosen the earth. Dig down about a foot or so, but avoid turning under the topsoil. You will probably have to do little or no digging in subsequent years, if you grow organically, with a permanent mulch, because the soil will be easy to work.

Sprinkle some organic compost thinly over the soil (or dig it in, if you wish), and cover with six inches of mulch. This should be done at least three or four weeks before the first planting. Tuck all your table scraps (preferably raw) in between the layers of mulch; this is called sheet composting. Start to do this immediately, and then continue this sheet composting after the garden is planted and growing. (Banana refuse is a particularly rich source of nutrients, and loved by earthworms.) These table scraps never become garbage. There is no odor or animal nuisance, if the scraps are hidden in the mulch—not too deep, say, an inch or two. As time passes, the organic matter in the soil will convert to humus, and biological activity of bacteria and earthworms will develop under the mulch.

5. Gardening The Magic Way—With Mulch, Compost, Sea Weed Spray

5.1 Mulch

You can mulch with anything that will decay, if it doesn't contain toxic or poisonous substances. Some materials are better than others. A very good mulch material, easy to obtain (at no cost) is grass clippings, your own or your neighbors'. If possible, spread them out to dry, before using them to mulch your garden. If you do use green clippings, don't apply them directly to the soil, as this can rob the soil of nitrogen. Spread green clippings in a thin layer on top of previously-applied "cured" mulch; this will allow them to dry. If applied in a thick layer, they may mat down, become slimy, build up heat, and develop odors.

Piled up or bagged green grass clippings will get hot, but, when spread on the ground, they don't even get hot enough to hurt earthworms. But don't put fresh or green mulch up against tender young plants, as enough heat may build up to scald the plant. Of course, trees should never be mulched right up to the

trunks, even if the mulch is "cured"—at least ten inches from the trunk for citrus trees and several inches for other fruit trees.

You should also use all the leaves you can get. There are many other mulch materials: hay, straw, wood chips, sawdust, cottonseed hulls, peanut shells, corn cobs, seaweed and sea grasses, ashes, and some others—almost anything that will decompose without being too messy.

Dried grass clippings mixed with leaves are often the most practical. This is clean and easy to handle, and enhances the appearance of your garden and trees. If you have oak leaves in your mulch, it will repel slugs, snails, cutworms, and June bug grubs. Alfalfa grass is an excellent mulch—it contains a valuable amount of nitrogen.

Maintaining a six-inch organic mulch at all times conserves moisture, and helps to produce the conditions for building a living soil and a top-quality garden. The mulch also creates conditions which discourage nematodes (microscopic worms which produce root knot, causing deterioration or death of plants). A permanent mulch also controls erosion, regulates soil temperature, and eliminates the necessity for spading, raking, cultivation, and weeding.

Cover crops will be unnecessary, you will need less compost, and fewer insect controls. The mulch encourages earthworms, which help to aerate the soil and enrich it with their castings. The soil will never get hard or muddy, the vegetables will be clean and pleasant to harvest.

Mulch makes "sheet composting" easy and practical—because you can tuck your table scraps in between the layers of mulch and there will be no eyesores, odors or other nuisance. It is not necessary to remove the mulch in the spring "so the ground will warm up" or in the winter when frost threatens. Because some weeds grow in cool weather, keep the ground well mulched all winter.

Mulch is indeed the gardener's "magic carpet," relieving him of many tedious tasks, and aborting a large percentage of incipient problems. If you make no other changes in your gardening methods, at least don't fail to take advantage of this easy "green thumb" idea.

5.2 Compost

Organic compost is a fertilizing mixture of various organic substances, which have been mingled and decomposed. Many people build their own compost in piles, pits or bins, and there are various methods of doing this, but it does take some space, lime and work, and you and your neighbors might also have to put up with some odors and flies, although there are ways to avoid both by careful planning and attention. If there are many citrus peels in the compost, there will be noticeably pleasant odor. Don't ever put in wet garbage without a covering layer.

One of the simplest method of building a compost pile is described in *Down to Earth Vegetable Gardening Down South* by Bullard and Cheek. Start with an eight-inch layer of grass, leaves and kitchen wastes (mingled or in any order); next a two inch layer of manure or other nitrogen source. Cover with a one-inch layer of earth, and sprinkle generously with water. Continue this three-layer series, building to a maximum height of five feet. If shredded materials are used, the compost will be ready in a few weeks, and no turning of the pile will be necessary. Occasional light sprinklings of dolomite lime will add nutrients (magnesium and calcium) and create a better balance, Greensand is another excellent soil conditioner. It comes from deposits laid down in what was once the ocean, and contains potash, magnesium, iron, silica and other trace minerals. Some other organic-fertilizing materials are rock potash, straw, alfalfa, hay, tobacco stems, peanut shells, and soybean meal. It is much better to include these fertilizing materials in a balanced organic compost than to try to use them individually.

5.3 Seaweed

Seaweed is a rich source of nutrients. If you can get seaweed or sea grass, use them. Some people prefer to wash the seaweed before using, or weather for three months, to reduce or eliminate the salt transfer,

but these processes may also leach out other valuable nutrients.

If seaweed is not available, you can obtain a nutritional seaweed spray. One of these products is called "Maxicrop Liquid Seaweed (Kelp Extract)." It is a soil activator and conditioner, and its use results in a crop of higher yield and better quality. It helps to produce stronger, healthier plants with greater resistance to insects, disease, and adverse climatic conditions. The effect is cumulative and the soil improves with each application.

6. Soil Requirements For A Successful Organic Garden

6.1 Nitrogen

A balanced organic compost should contain nitrogen, phosphorus, and potash (potassium). As a rule, calcium, sulfur and magnesium, as well as trace elements like zinc, boron, manganese, molybdenum, copper, and chlorine (and many other trace minerals, known and unknown) will be available in your soil for plant nutrition, if you are constantly adding a variety of organic materials to your soil.

Nitrogen is important in the production of protein; leafy, green vegetables, especially, need adequate supplies of nitrogen. Too little nitrogen will be evidenced by pale green leaves, progressing to yellowing and dropping of older leaves, and stunting of growth. Too much nitrogen will produce an excess of greenery and little or no fruiting, and the plants may be spindly and weak, and susceptible to disease.

Nitrogen is supplied by blood meal, castor pomace, soybean meal, cottonseed meal, fish meal, or feathers, or bone meal, or straw, alfalfa hay, or manure. If you use bloodmeal or manure, use it very sparingly.

Nitrogen is also supplied to the soil by growing legumes, which capture nitrogen from the air, enriching the soil in which they grown, as well as adjoining areas. (The air is almost 80% nitrogen.) Earthworms will also help supply nitrogen to the soil. See the article "Nitrogen Fixation" in this lesson.

Planet Natural carries "Alaska Fish Emulsion," an excellent source of nitrogen. *Do not* add concentrated nitrogen to plants when fruits are ripening. To encourage ripening, add either a balanced compost, or phosphorus or potash.

6.2 Alfalfa: The Best Source of Nitrogen (Plus Growth Stimulation)

In 1975, Dr. Stanley K. Ries, a horticulturist at Michigan State University, found that alfalfa treated plots produced increases far above what the nitrogen in the alfalfa could account for.

In the laboratory, they isolated the active agent—triacontanol, a fatty acid alcohol which occurs naturally in the plant's leaves. Triacontanol is not a fertilizer, but a growth stimulating substance.

The Rodale Organic Gardening Research Center tested the use of "greenchop" alfalfa in extremely small counts. Both Ries and the Rodale Center reported (*The Best Gardening Ideas for the '80s*) that the less alfalfa they applied, the better the yield—but, with no alfalfa, they got the lowest yield. The amount used which provided the best yield works out to about one cup of fresh chopped alfalfa for 100 square feet of garden. Simply spread it over the plot, work it in, and plant your vegetable seeds. Use mulch as usual.

The Rodale book says that the methods and rates of application are still in the experimental stage.

The main advantage of alfalfa is as a nitrogen-fixing legume. Fresh-cut alfalfa contains more nitrogen than any manure. Use alfalfa in the garden as a soil-enricher to be rotated through the garden, or as a patch to produce a high-nitrogen material for mulch.

6.3 Phosphorus

Phosphorus is necessary to the production of plant sugars. The symptoms of phosphorus deficiency are similar to those of nitrogen deficiency, but the leaves may be dull green with purple tints. Some phosphorus sources are rock phosphate, bone meal, granite dust, natural limestone, gypsum, and fish scraps.

6.4 Potassium (Potash)

Potassium (potash) is essential to the life processes of plants. It is helpful in hastening development and maturity. Symptoms of potassium deficiency are slow growth and leaves with mottled yellow tips and edges, and scorched-appearing edges on older leaves. Seaweed or seaweed spray provides generous amounts of potassium. Some other potash sources are wood ashes, granite dust, potash rock, citrus rinds, kelp, greensand, and bone meal.

6.5 Calcium

Enough calcium will usually be present in the soil, but bone meal will supply some additional calcium especially needed for grapes, celery, and sometimes tomatoes.

6.6 Sulfur

Like nitrogen, sulfur is a protein provider, and will usually be present in adequate amounts in the organic garden.

6.7 Magnesium

Magnesium is a vital nutrient, important in the leaves of living plants. It is necessary for the process of photo-synthesis—through which plants manufacture their own food and fuel—utilizing energy from the sun, carbon dioxide from the air, and water and nutrients from the soil. Usually there is enough magnesium present in the soil of an organic garden. However, occasionally, an acid-loving plant will indicate a deficiency, evidenced by yellowing leaves, which may be corrected by using dolomitic limestone or raw phosphate rock.

6.8 Feed the Soil Which Feeds the Plant

See the list of compost materials, with percentages of nutrients, in the supplementary section of this lesson.

Organic compost—and the various nutrients of organic origin which may be added to the soil—do not overwhelm plants with a tremendous amount of one particular element, as can happen with chemicals. The chemicals attempt to feed the *plant*, whereas the organic fertilizers feed the *soil* which nourishes the plants.

This more natural way produces the best food, and makes it unnecessary to be preoccupied with exact ratios of various elements, such as the 6-6-6 chemical fertilizers (6% nitrogen, 6% phosphorus, 6% potash). Generally speaking, these nutrients from organic sources should be added in approximately equal amounts, but be particularly careful not to use too much nitrogen from animal sources (such as manure, blood meal, or dried blood). Your soil will make the best use of the organic fertilizers for the

nutrition of your plants.

Sand Mueller, instructor in horticulture at Triton College in suburban Chicago, says that seven years ago he was operating a conventional greenhouse in New Mexico. He visited greenhouses all over the Southwest, all of which used agricultural chemicals. All of them had insect problems, and all of them used powerful poisons.

Mueller had read claims by organic gardeners to the effect that their healthy plants had little or no insect problems. He says, "I believed these assertions were preposterous, as did every horticulturist I knew."

But he eventually decided to try the compost idea, and his insect and disease problems rapidly began to disappear. After he started to compost, he learned the law of survival of the fittest in the plant kingdom.

Mueller tells how, in 1936, a British agricultural scientist, Sir Albert Howard, grew half a field of alfalfa with artificial fertilizer and half with compost. His oxen devoured the compost-grown alfalfa first. Given a choice, animals will always select the organic food.

After building up the health of the oxen with the organic feeding, Howard deliberately exposed them to the hoof and mouth disease, but none of the oxen became ill. Dr. William Albrecht, professor of soil science at the University of Missouri, corroborated Howard's findings.

In 1976, Mueller offered his flock of chickens the choice of commercial feed or grains he had grown in composted soil. He says, "With a cacophony of cackling and scratching, my hens asserted the truth of Howard's claim."

Mueller says, "The horticulture establishment has only one response to compost and that is ridicule. It is the response of ignorance. I do not believe that there exists anyone in the field of agriculture who has tried organic agriculture who now advocates chemical agriculture."

7. Approximate Amounts Of Compost, Mulch And Water

Before planting vegetable seeds, put in fifteen pounds of compost per one-hundred feet of row. Even if the compost is put in immediately before planting, the compost will not burn the seeds as does chemical fertilizer. If possible, however, put the compost in at least a week or two beforehand.

After the seeds are planted, soak the ground every day until the seeds sprout, then every other day. Put in one inch of mulch when the seeds begin to sprout. Add more mulch as they grown taller. Put more compost between and around the plants when they begin to bloom, and again when fruiting.

When setting *seedlings* or *plants*, put in the compost, then cover the ground with one inch of mulch, and then set in the plants. Soak the ground every day for two or three days, preferably in the late afternoon, then every other day.

8. Planting Your Garden

Select the sunniest spot for your garden, but near a source of adequate water. Morning exposure to full sunlight is the most beneficial. If part of your garden is shaded, that is the place to put leaf crops. Avoid low wet areas.

A good size for a family garden is 200 to 600 square feet in area, but smaller ones will also produce a lot of vegetables if planted with small seeds such as lettuce and carrots. Plant seeds in rows that are six inches wide, with six inches between the rows. This pattern will result in a harvest of approximately four times as much as you would get from single rows. Leave a walk space of about 16 inches between each 18-inch unit.

Map the layout of your garden. To minimize shading, arrange low-growing vegetables along one side of the garden, medium-tall plants in the middle, and tall ones on the other side. Design your garden with companion planting and crop rotation in mind. (Details later.)

Plan to grow the vegetables you like to eat, and be sure to get seeds that are suitable for planting in your area. Don't use seeds that have been treated or dipped in chemical solution. Look for the varieties that have been developed for resistance to disease.

Don't use last year's seeds—they seldom come up as well as fresh seeds. In most cases, it is not a good idea to save your own seeds. They often do not grow true to type, and the amount of labor spent collecting, drying, and storing these seeds will probably make them twice as expensive as buying new seeds.

If you soak your seeds for a few hours, or overnight, or even twenty-four hours, before planting, germination will be easier and more certain. Soak in plain lukewarm water, or, better yet, in a 1% solution of seaweed spray. If you sometimes don't take the time to soak your seeds, try using the 1% seaweed solution as a seed dip.

Don't sow the seeds too thickly, and be sure to cover them with soil to a depth of about four times their diameter. Firm the soil by patting or walking on it. Then stay off the planting area. The seeds must be kept moist until the seedlings appear.

For a steady supply of vegetables, make successive plantings, or plant several varieties of the same vegetables but with different maturity dates.

You might decide to use some started plants, especially if you are a little late in starting your garden. When thinning and transplanting plants, handle them carefully, allow as much earth as possible to cling to their roots, and give them a good watering after transplanting. Do your transplanting after the sun has gone down.

Be sure to plan for as many fruit trees as possible, limited only by the available space and your ability to care for them. If you harvest more fruit than you can use, you will have a good marketable crop, especially when organically grown. Offer your surplus fruit (at a fair price) to your friends, neighbors, health food stores, and supermarkets. If you have a large crop, it could even be advertised with good results.

Give your fruit trees what they need, but don't feel you must be doing something for them constantly. Mostly, you should leave them "intelligently alone"—the same advice as Hygienists give for the care of the human body. The trees can work out most of their problems by themselves, if you do not complicate the situation by the use of poisons.

Don't overlook grapes and berries! Be sure to select the proper varieties for your area. And don't forget to include some nut trees.

More details about fruit and nut trees will be given in the next lesson: "The Pluses in Orcharding: How to Get Started."

9. Insects: Friends And Foes

An organic gardener does not try to destroy the entire insect population in his garden. Not only is this the epitome of futility, but it is neither necessary nor advisable. There will be some insect damage, no matter what is done. Ignore the early signs, and don't feel you must do something about it, unless your crop is threatened. Eventually, you will learn to recognize your friends in the insect population: the ladybug, the praying mantis, beneficial beetles, flies, wasps, lacewing flies, fireflies, dragonflies, and spiders. They are predator insects whose food is the scavenger insects, preventing them from increasing to dangerous levels.

The first step to insect control is, of course, the building of a living soil, containing all the substances necessary to produce healthy, disease-resistant and insect-resistant plants. Next, be sure to provide adequate moisture for your garden. Your permanent mulch will help to conserve the moisture, and will create conditions which discourage many insect pests.

9.1 Companion Planting

An important step in insect control is companion pluming. Wild plants almost always grow in mixed communities, where each type of plant contributes to the support of others growing nearby.

Even when plant species are mixed with no planned basis, insect problems are reduced. The more of the same plant you have growing together, the more insects are attracted, as they get the clear signals from the larger planting. Interplanting and aromatic herbs confuse their sensory apparatus.

Companion plants influence, complement or supplement each other, and grow in harmony together. Mixed plantings tend to create and maintain a natural balance between beneficial and destructive organisms.

Members of the same plant families, which are subject to the same pests and diseases, should be separated—like tomatoes and potatoes; cucumbers, melons, and squash; and cabbage, broccoli, and cauliflower.

Legumes capture nitrogen from the air, feed it to adjoining plants, and enrich the soil in which they grow. Beans, corn, and cucumbers like to grow together. Or plant beans with eggplant and rosemary. Soybeans, especially, deter chinch bugs and Japanese beetles. Plant peas, leaf lettuce, strawberries and cucumbers with carrots, radishes and chives; turnips with peas; onions and garlic with most vegetables except legumes. Beets and onions are compatible; so are leeks and celery. Plant cabbage, broccoli or Brussels sprouts with beets, kohlrabi, and cucumbers.

Tomatoes are good with onions, parsley, carrots, and marigolds, but do not like kohlrabi. Bush beans like beets and potatoes. The strong scent of marigold seems to act as a deterrent to insects throughout the garden, and their roots secrete a substance that kills nematodes. Be sure to plant some around tomatoes and beans.

Some plants need a lot of light and are excellent companions to those that need partial shade. Lettuce likes cabbage and beets, but can also be put under tall plants that provide some shade. Deep rooting

plants bring up the minerals from the subsoil, enriching the top layer, and they aerate the soil for plants with a shallow root system.

Plant nasturtiums in your vegetable garden near broccoli, cabbage, cauliflower, and cucumbers, and between fruit trees, to repel aphids. Chives and onions will also repel aphids. Garlic will prevent bacteria damage and damage from peach borers. Garlic and onions will deter most pests, but don't plant any near beans or peas. Most strong smelling plants are useful in repelling pests.

There is a long list of companion plants, vegetable preferences and insect repellent plants and herbs. You will find such a list in the article section.

Companion planting, and the use of insect repellent plants, will not prevent insect damage, but will reduce it considerably; it will be a profitable investment.

9.2 Crop Rotation

Crop rotation can help to prevent and control perpetuation of many problems, such as depletion of particular trace elements in specific areas of your garden, and perpetuating insect problems or diseases that can survive in the soil from one year to the next. Implementation of the available information about crop rotation can contribute to a successful garden.

If you are maintaining a permanent mulch, crop rotation may not be absolutely necessary, but it is still an excellent idea, and it does not entail a great deal of extra trouble to relocate plantings each year. If you would rather not bother rotating, but will maintain a permanent mulch and keep building the soil, try doing without the crop rotation; you may find it will not be necessary in your garden. However, I believe rotation to be a good precautionary measure at least in the second and third years of your garden, even if you decide to abandon this procedure after your soil has been built up.

For those who do want to take advantage of crop rotation, here are some suggestions:

Avoid growing the same vegetables (or crops of the same family) in the same location more than once every three years. Plants subject to the same problems should not follow each other in the same bed. Don't use successive plantings of lettuce, cabbage, or celery in the same soil. They are subject to the same fungus attacks.

Cucurbits (cucumbers, squashes, pumpkins, gourds, melons) should not be grown near any other member of the gourd family, and there should be a lapse of at least three years between plantings of any of these in a specific area in order to reduce the risk of the fungus disease anthracnose.

Heavy feeders should be followed by light feeders. Leaf crops consume large amounts of nitrogen from the soil, root crops use up the potash, so don't plant turnips after carrots, nor lettuce in the same bed, year after year.

Legumes (peas, beans) are excellent to precede or follow potatoes, but not to precede sweet potatoes. Members of the cabbage family, or lettuce, are excellent choices to follow legumes.

A rotation chart for vegetables to follow legumes (*Organic Gardening*, March 1974) suggested cabbage, broccoli, Brussels sprouts, mustard greens, lettuce, and parsley, as first choices; corn, leeks, shallots, radishes, turnips, onions, and Irish potatoes as second choices; tomatoes, eggplant, peppers, and okra as third choices; and suggested that the following vegetables not be used behind legumes: carrots, beets, sweet potatoes, cantaloupes, pumpkins, cucumbers, squash. The varieties of legumes upon which the experiments were based were: Crowder, Purple Hull, Silver Skin, and English Peas; and Bush Lima, Pole Lima, Bunch Snap, and Pole Snap Beans.

Leaf vegetables or cucumbers that have had lots of compost may precede or follow potatoes. Potatoes should never follow tomatoes or vice versa.

Don't plant peppers where cucumbers have grown within the last year.

Be sure to grow a variety of vegetables and don't be afraid to experiment. Failures with some will be offset by successes with others, just as in any other method of gardening.

Crop rotation is so little trouble that it seems a shame to overlook this method of increasing the potential of your garden.

9.3 Biological and Logical Insect Controls

Start out with the idea that some insect controls will be necessary, especially in the initial period before your soil has been built up. You may want to try biological controls like praying mantis egg cases, Trichodrama wasp eggs, or imported lady bugs—success with these varies. The problem with these imported insects is that they may soon migrate to another location that suits them better.

Another very successful biological insect control is the presence of birds, toads, lizards, etc. Provide trees, bird-houses, bird baths and bird feeders, and shallow pans of water on the ground for the toads and lizards, who will also appreciate shrubbery and mulch.

Sanitation and good housekeeping in your garden will prevent a lot of problems. Carefully remove and destroy all diseased plants and wash your hands thoroughly before handling other plants. Remove all dropped fruit and garden trash. Watchfulness and handpicking is an old-fashioned, but effective, method of controlling some insects.

Cardboard collars around the stems of your plants help to ward off cutworms. Aluminum foil collars around young seedlings keep off fleas, reflect the rays of the sun and give the plant more warmth.

Other effective insect controls are wood ashes, black pepper, lime, or rock phosphate dust mixed with water, and a homemade spray or drench of garlic, onions, hot red peppers (and a little soap to make it stick). A good recipe is one cup hot peppers, three whole garlic bulbs, three medium onions. Blend with one pint water (or a little more). Strain, add enough water to make one gallon, and apply to both under and on top of leaves. It is easier to use this in a sprinkling can, as it may clog the sprayer, but you may have to use a spray for the undersides of the leaves.

Beer (or a solution of baking yeast, or any other ferment) in a shallow dish attracts slugs—and drowns them. Wet areas are their hiding places.

Rye flour or clay, dusted on plants when the morning dew is fresh, will trap soft-bodied insects and the sunshine will bake them.

Decayed insect sprays or drenches are useful. Insects are repelled by the scent of dead bodies of their own species.

A spray or drench of soapsuds is effective against aphids, mites, and plant lice. Rinse with clear water within a few minutes.

Some experiments made in 1979 at the University of California, showed that soap solutions can be used effectively to combat a number of plant-feeding insects. Among the soaps which were included in the experiments were "Shaklee's Basic H" and "Fels Naphtha Laundry Bar" soap. The least damage to plants was achieved when the liquid formulations were used at 1% to 2% (7 teaspoons to 5 tablespoons to the gallon); and bar soaps or powders at 1.5 to 2 ounces per gallon of water. More concentrated solutions provided more effective control, but also increased the potential for plant damage. Of course, soap solutions do not have any residual activity, and repeated applications are necessary. However, even when applied only once or twice a year, beneficial results are achieved. It is best to use soap, *not detergent*. Three tablespoons of "Ivory Flakes" to a gallon of tepid water is safe and effective.

9.4 Insecticides, Repellents, Fungicides

If you must resort to insecticides for your garden and trees, some which will not poison your food are available. A dormant oil spray, obtainable at nurseries, in a 3% miscible solution, may be used during the

dormant period on certain fruit trees, and also, in a weaker dilution, as a spring and summer spray, to control certain insects. This is an effective control for many sucking and chewing insects, including aphids, thrips, scale insects, mites, red spiders, white flies, and mealy bugs. The eggs of codling moths, oriental fruit moths, leaf rollers, and cankerworms are also destroyed.

A one-time application of "Milky Disease Spore Powder" (called "milky" because it causes an abnormal white coloring in the insect) will prevent damage by Japanese beetles on your property and your neighbor's, since it spreads underground. It is supposed to be harmless to everything except the Japanese beetle grub.

An excellent multipurpose control of caterpillars and chewing insects is the product "Thuricide" (another spore-type pest disease, called Bacillus Thuringiensis) which is extremely efficient for use in the vegetable garden on vines and fruit trees, and kills more than 100 species of harmful insects. The instructions say this product may be used up to the day of harvest. To be effective, the leaves of the plants must be ingested by the insects, as "Thuricide" is a stomach poison for them. "Dipel" is another manufacturer's name for the same formulation.

Most diseases exhibit specific symptoms, so it is not too difficult to differentiate from insect damage. It is not difficult to identify insect damage caused by sucking insects like aphids or thrips, and chewing insects like caterpillars.

Sucking insects cause leaves to curl and become spotted, or they may turn yellowish, stippled white, or gray. These insects and their brownish eggs or excrement can often be seen on the underside of the leaves.

Aphids cause curling or cupped leaves, or round or conical protrusions. Thrips leave a black deposit of tiny specks, or whitish streaks.

Caterpillars, grasshoppers, weevils, and flea beetles are some of the chewing insects which eat the leaves. Flea beetles make tiny round perforations; weevils produce angular holes, beetle larvae (grubs) skeletonize leaves, eating everything but the veins.

Red spider mites, which are so tiny they are practically invisible, deposit tiny tents of fine cobwebs on terminal leaves, and can be found (with a magnifying glass) on the underside of the leaves—under a strong magnifying glass in a good light, you may see tiny specks about the size of fine meal.

Cyclamen mites cause deformed leaves; leaf miners produce blotches or tunnels. Round or coned protrusions can be caused by either midges or gall wasps.

Both nematodes and gall wasps can cause the partial or total collapse of a plant.

A useful product suitable for organic gardeners is "Neutral Copper" by Southern AG, a fungicide which, when used according to directions, will control many plant diseases, without poisoning your food. I have not found it necessary to use the neutral copper spray on any of our vegetables, but have used it on avocado trees, citrus trees, and some grape vines. It should be used, sparingly, at the first signs of disease. It may also be used as a precautionary measure on avocados, mangos, citrus, and some varieties of grape vines (not necessary for muscadine grapes) to avoid infection from scab and antracnose and some other diseases. These plants are subject to such diseases (which may be averted through the occasional use of a fungicide).

The best time to apply neutral copper as a preventive of disease is just before new growth starts in the spring, and when two-thirds of the petals have fallen. It is not advisable to use a neutral copper spray in the fall on your citrus or other fruit, as its use at that time of the year may prevent the fruit from sweetening. If disease problems occur at this time of the year, just prune out the infected leaves and dead wood.

Some of the specific symptoms of plant diseases are:

1. Brown circular spots on fruit, or dieback of twigs and loss of leaves about a foot from the tips

(fungus).
2. Rust—leaves look like they are covered with rusty powder (fungus).
3. Fire blight—drying up of blossoms, blossom stems, or fruit (bacterium Erwinia amylovora).
4. Dark brown spots in leaves with small pinpoint-like objects (fungus).
5. Grayish-white leaf with brown margin (mildew).
6. Discoloration of stem at ground level—slick and slimy (damping off).
7. Leaves that show watersoaked areas within leaf (bacterial infection).
8. Circular spots with definite color around the outside of the infected spot (fungus).
9. Leaf gall (azaleas)—thick growth causing excessive cells (fungus).
10. Mold on plants may be due to location in a cool, damp, sunless area.

One should use a little soap (not detergent) as a spreader-sticker for all sprays, so they will adhere to the plants, instead of running off. The products referred to above usually need to be used only rarely and sparingly. It doesn't take long to learn to recognize insect damage or disease and to evaluate the necessity for controls. Most healthy plants, however, rarely need controls.

Tobacco stem mulch will repel aphids, flea beetles, and thrips, but should be used cautiously, if at all. Some plants, like tomatoes, don't like tobacco; and the nicotine content of such a mulch may kill beneficial earthworms, insects, and organisms. Tobacco could also carry disease to some of your plants, especially potatoes, eggplants, tomatoes, or peppers. I don't use tobacco stem mulch.

Black leaf— a nicotine spray—may be used as an emergency treatment for aphids, thrips, or other small insects, but use it only if you must. It is subject to many of the objections listed above for tobacco mulch. I don't use "Black Leaf."

In extreme cases for emergency use only for a severe infestation, it might be necessary to use one of the insecticides made from rotenone, pyrethrum, ryania, or quassia, which are plant extractives. "Sevin" (available at nurseries and garden supply stores) is such an insecticide, and will control the bean leaf roller and the bean skeletonizer, and various other insects, but you ought to first try "Thuricide" for these problems.

The plant extractive insecticides, such as "Sevin," should be discontinued completely as soon as moderate control has been attained. They are not completely hamless, but there will be no residue if you wait fourteen days before harvesting. I have never resorted to these insectides, and, of course, would never even consider the use of a more dangerous insecticides like "Malathion."

If you would like acceleration in your recognition of insect damage, diseases, deficiencies, and problems in your garden, and want to study the subject, see pages 590-91 (deficiencies) and pages 340-51 (diseases) in Rodale's *How to Grow Vegetables and Fruits by the Organic Method* and *The Bug Book* by John and Helen Philbrick.

Gil Whitton, Pinellas County (Florida) Agriculture, recommends Cynthia Westcott's *Plant Disease Handbook*, which is available in libraries as a reference book. As Mr. Whitton says (St. Petersburg, *Florida Independent*, 3/6/75), "No one book or person can have all the answers."

If you have problems with "raiders" (rabbits or other small animals), this can be very frustrating. The best solution is a fence to keep them out. See the article in this lesson, "Containing Inhibits Raiders."

10. The Case Against Commercially-Grown Foods

10.1 Hazards of Chemical Fertilizers, Pesticides, Fungicides, Herbicides, Fumigants, etc.

The snowballing evidence against chemical pesticides culminated in Rachel Carson's landmark book, *Silent Spring*, led to the ban in the United States of D.D.T., and restrictions on the use of other poisons on food crops.

On December 25, 1975, an article appeared in the *St. Petersburg* (Florida) *Independent*, entitled "Pesticides Can Kill People, Too." Georgia Tasker, of the Knight Newspapers, wrote about the experience of Joan Cole with the insecticide "Sevin" (which is not supposed to be as bad as such insecticides as "Malathion"). She dusted a big tomato ring with "Sevin" on a dry day. A couple of days later, she decided to discard the plants altogether, and jerked them out on a windy day. The next day she felt as though she were having a nervous breakdown. She couldn't get up, she couldn't think straight. Ms. Cole said, "I had really panicky feelings. My whole body sort of went into limbo or something." The next day, when she felt a little better, she racked her brain, and then in dawned on her that she must have inhaled "all that damned stuff."

The article continues, "Dr. John Davies, a pesticide expert at the University of Miami Medical School, has been analyzing the tissue of a Fort Walton Beach (Florida) woman who recently died. Initial autopsy tests indicate Mrs. R.J. Clark may have become fatally ill after inhaling too much nemagon, a pesticide used to control nematodes. "Helen Lund, another Miami gardener, has given up using pesticides altogether. She was caring for the plants of vacationing friends and mixed some Malathion, used it, and decided to take the leftover mixture home. She drove home with it in the back seat of her car. By the time she reached her house, she was dizzy and sick to her stomach. She said, 'I got to thinking this is going to kill the birds—and me.'

"So while the Environmental Protection Agency continues to crack down on dangerous pesticides, banning in July of this year chlordane and heptachlor except for very limited use, the possibilities of severe sickness and death are always present when using any pesticide."

The World Health Organization has released figures disclosing almost 500,000 *reported* cases of pesticide poisoning in 1981. For every reported case, how many others do not report or even recognize the relationship of their ailments to pesticide exposure or ingestion?

As Hygienists, we are concerned about the hazards of ingesting chemical residues in our drinking water or in our food. How many thousands of workers are also exposed to the dangers involved in handling pesticides, or in growing or handling the crops?

10.2 The "Benefits"?

The chemical cartels maintain that the risk is small compared to the benefits achieved. *What benefits*?

Modern insecticides are nonselective, killing or injuring beneficial insects and animals, and persisting in the environment, upsetting the ecological balance. *All* chemical pesticides upset the eco balance so significantly that crop yields eventually diminish.

The National Audubon Society says, "Between 80 and 90 percent of pesticides used in homes and gardens do no good at all. More often, they do harm. These chemicals are a hazard to wildlife, pets, and humans. None of them are totally safe. And they often cause more problems than they solve."

10.3 Chemical Fertilizers vs. Organic Methods

Chemical fertilizers may initially increase the abundance of crops, but the eventual result of failing to replace the exhausted elements of the soil is depletion.

Tests made in the early 1960s on the Rodale crops in Emmaus, Pennsylvania, indicated a decided superiority in nutritional value of organically-grown food over the commercial varieties. Crops were grown side by side, half organically and half commercially (using chemical fertilizers and insecticides). Otherwise, the conditions were identical.

The crops were then tested to see how they compared in nutritional value. Six nutrients were measured, and the reports indicate the superiority in nutritional value of organically-grown food. The following comparisons between the organically-grown and the commercially-cultivated wheat and oats gives the higher percentages of these six nutrients in the organically-grown crops:

Nutrients	Organically-Grown Oats	Organically-Grown Wheat
Protein	28% higher	16% higher
Vitamin B1	92% higher	108% higher
Vitamin B2	171% higher	131% higher
Niacin	100% higher	63% higher
Calcium	25% higher	29% higher
Phosphorus	3% higher	1% higher

But the best proof is when we taste and enjoy the better flavor of the food.

An article in the *Palm Beach* (Florida) *Post*, July 29, 1974, by Bryce Nelson, Chief of the Middle Western Bureau of the *Los Angeles Times* in Chicago, tells about organic farmers who increased their yields, increased the quality of their produce, and improved their own health and the health of their stock. Most of them sold their products at regular prices on the open market. The organic farmers said their fertilizer cost was lower, they had to do less work to get as high or higher yields than chemical farmers, and they were happier.

In a 1976 study for the National Science Foundation, Dr. Barry Commoner determined that organic farming methods produce foods more economically, and of higher quality. The study, made with organic farmers in five states, showed that foods cost $16 an acre less to produce. (The claim is usually made that organic farming is more trouble and more expensive than chemical farming.)

More recently, Purdue University Agronomist Jerry Mannering reported evidence of the importance of organic matter to plants. The correct chemical and physical composition, of the soil, and the soil energy, can be maintained only by conservation and replacement of organic matter. Only organic matter can create and maintain in the water-holding and nutrient-holding capacity of soils.

10.4 No Differences? Use Supplements?

Numerous representatives of vested interests maintain that there is no difference in the .nutrient quality of safety between chemical food production and food produced organically.

Other vested interests maintain (and even exaggerate) the food deficiencies created by chemical food production, and offer a solution—vitamin and mineral supplements.

Hygienists must face these issues squarely, and determine how to resolve the contentions resulting from these claims.

Synthetic fertilizers may initially help produce *larger* fruits and vegetables, but they are often lacking in taste and lower in nutritional value. Vitamins and minerals, proteins and enzymes in foods that are produced organically have repeatedly been shown to be superior, qualitatively and quantitatively. And, inexorably, when the soil is depleted, exhausted by the use of chemical agriculture, what then?

In 1900, wheat in Kansas contained about 18% protein. Today Montana wheat (grown in virgin soil) also contains 18% protein. But Kansas wheat today contains only 11% protein, because the virgin soil is depleted and the farmers are using chemical fertilizers.

The late John Tobe, in *The Provoker*, November-December 1976, said, "The food processors and chemical corporations have arranged for various professors of great universities to go on the stump and make statements that there is no special value in organically-grown foods. Here I would like to tell you about some research that was conducted at the Massachusetts Institute of Technology. Many foods grown in the United States were compared with their counterparts grown in Mexico, Central America and Latin America. It was found that many of the foods grown in the U.S. are lower in nutritional value than the same foods grown in Mexico, Central America, and Latin America, where chemical farming has not been established." The caption of the article is "Sometimes It Pays To Be Blind."

Many people acknowledge that commercially-grown food is deficient in nutritional value, and it is well known that organically-grown food is more abundant in trace elements, which are necessary to life. One example is the deficiency of copper, a necessary trace element, which is destroyed by chemicalization. Too many people try to restore these deficiencies by augmenting their diets with food supplements (pills, powders, liquids) in the vain hope of supplying missing nutrients. It can't be done! In the lesson about food supplements, you learned that these products are useless, and even damaging.

11. Four Methods

There are four methods of gardening:

1. Natural—This method does not poison the soil, but does deplete it, especially of nitrogen, and its productivity gradually decreases.
2. Chemical—This method increases the production the first and second years, at the cost of flavor and nutritional value (lower protein content and higher carbohydrate content) and destruction to the environment. The plants must rely on artificial chemicals to stimulate their growth, and, as time goes on, more and more chemicals are needed and problems increase. Insects mutate and develop resistant strains, the microorganisms and earthworms in the soil are killed by the chemicals, and the farmer or gardener develops neurological diseases from inhaling the sprays or absorption through the skin.
3. Organic—This method replenishes the soil, and is the method described and advocated in this lesson, to produce a better-quality crop, without poisoning the food, the environment, or the gardener. The organic gardener uses only organic materials (organized living matter).
4. Biodynamic—The term "biodynamic" refers to "working with the energies which create and maintain life." This method of agriculture uses organic methods, including compost, but also uses

herbal preparations to spray the plants and trees. The basic ingredient of the biodynamic spray is a specially-prepared colloidal clay compound. The spray flows into all small cracks and crevices of the plant and forms a protective film, to help in healing minor lesions, but does not interfere with the respiration of the plant. The spray also contains very low percentages of such insecticides as ryania, rotenone, pyrethrum, and quassia, far below customary concentrations, because the spray is not intended as an eradicator. These insecticides are plant extractives, but are not completely harmless, as indicated previously. The recommendation is to wait fourteen days after spraying before harvesting. The biodynamic spray is also available without the insecticides. The biodynamic spray is also said to enable the plants to derive certain nutrients from the atmosphere. This system was originally started by Rudolph Steiner, and developed by Dr. E. E. Pfeiffer. The biodynamic method is more sophisticated, more complicated, and more work than the organic methods described in this lesson. We tried biodynamic methods in Indiana, but found them more difficult and no more productive than simpler organic methods.

An amusing illustration of the difference between natural and organic methods is a story told by Dr. Alec Burton at American Natural Hygiene Society Conventions about a gentleman who came to Yorkshire, England, and took over an extremely dilapidated property. He did a great deal of work on this property, renovating it and getting it into a beautiful condition, and, eventually, people came from miles around to admire and appreciate his garden. One day the local priest came to see it, and said, "What a beautiful garden you have!" The man said, "Yes, it's been hard work, and I've done it all by myself." "No," said the priest, "with the help of the Lord." The man said, "All right—with the help of the Lord, but you should have seen it when he was doing it by himself."

There is quite a bit of information available for the organic gardener who warns to learn how to get maximum results. *How to Grow Vegetables and Fruits by the Organic Method* by J. I. Rodale and staff (mentioned previously) is an excellent comprehensive reference book, listing practically all varieties of food plants, with detailed planting instructions for each.

For those who want a few simple rules for growing food with a minimum of time and energy, moderate success can be anticipated by simply using organic methods, instead of chemicals; and mulching instead of cultivating and weeding.

12. No Space For A Garden?

If you live in an apartment or condominium and don't have space for a regular garden, you can still grow some of your own food on your porch or patio. You can use boxes, barrels, or make a wall garden. Small plants like lettuce, squash, cucumbers, or strawberries need boxes only four to six inches high. Tomatoes, peppers, cauliflower, and cabbage need more space for their roots, and these boxes should be at least ten or twelve inches high.

Vine branching plants (cucumbers, squash, melons) can be trained to spread over the patio floor (concrete or whatever). They require little box space. Grapevines can be planted along a building wall or fence.

You can build a wall garden anywhere you have a little space. Annie Silvan describes a wall garden and how to build it. She says that it is like a large block or wall of soil with plants growing out of all sides. "You will need four one-by-six boards two feet long, four one-by-six boards five feet long and at least 14 two-by-two poles four feet long." Make two bottomless boxes out of the one-by-sixes —a frame for

the top and one for the bottom. Nail the two-by-twos to these frames, one foot apart. It will look something like a cage with vertical bars. Leave the bottom and the top open, but line all sides (inside) with open mesh wire and then black plastic. Secure the mesh with wire. Place the wall in its permanent position, fill with soil, and water from the top so the soil will settle. Use tomatoes and root vegetables at the top; lettuce, strawberries, cabbage, cauliflower, or any leafy greens on the sides. Make little holes in the plastic to insert the plants. Water all around and on top.

Patio tomatoes (in pots) are easy to grow. Leaf structure is easy to grow. I once grew some in several large flower pots. You can grow sunflower seeds to the green leaf stage in flats by pressing unhulled seeds into the soil and keeping them moist. They are ready for harvesting in a week. Buckwheat, adzuki beans, lentils, mung beans, or any other seeds or beans can be grown the same way, and will produce a product which is superior nutritionally to seeds sprouted with only water, since they will have the benefit of the earth, sun and outside air.

When no other way is possible, sprout your seeds on your kitchen counter in jars or other containers. We use alfalfa sprouts almost daily. Alfalfa is known to contain trace minerals which may be lacking in other plants. The root system of field-grown alfalfa reaches down as deeply as fifteen feet into the subsoil, picking up minerals not present higher up, and these minerals are, of course, present in the seeds in the sprouts.

12.1 Do The Best You Can

Grow as much organic food as you possibly can. Seek out and share with other organic growers. Import organically-grown nuts, seeds, and dried fruits from other areas. Keep trying to produce or obtain fresh organically-grown produce.

For the rest (if any) some compromises may be necessary. Get the best-quality food obtainable, wash in plain water, peel waxed fruits and vegetables, and do the best you can. Try to obtain foods grown on different soils, in different parts of the country, to insure obtaining a variety of trace minerals which may have been damaged or destroyed in certain areas: If you eat most of your food uncooked, you will still attain a higher degree of health than conventional eaters.

13. Harvest Of Pleasure And Health

I believe there will be a few who will dispute the environmental improvements that will accrue because of the deemphasis on chemicals and poisons, advocated by the organic gardener. If you learn about, and implement, organic gardening methods, you will also find them practical, convenient, agreeable, and economical.

And there is so much personal satisfaction in the creation of living plants in cooperation with the forces of nature—you come to regard your plants and trees as children whom you love and foster, and who respond by giving you their fruits.

What is more rewarding and thrilling than seeing the first seedlings, or the blossoms, or the fruits ready to harvest? But, best of all, the food you harvest will be flavorful and delicious, bursting with the nutrients you have helped to supply; and clean and free of residues of chemical fertilizers and poison sprays.

The, only way to obtain a full complement of all the vitamins, minerals, enzymes, hormones,

chlorophyll, carbohydrates, and other substances (known and unknown) in ideal combinations, is by eating the living food. Your harvest of organically-grown food will supply the needs of your body for optimal health.

14. Questions & Answers

Is it safe to mulch with grass clippings that have been treated with herbicides?

It would be best to find out from your neighbors whether they are using herbicides before using their grass clippings. If you see dandelions in the grass, that is a good sign. However, the most commonly-used herbicide, "2, 4D," is not absorbed by grasses in amounts great enough to affect vegetables. Don't use suspect clippings in the green state. Either compost them or put them aside for a couple of weeks. Soil microbes usually break down the chemical weed killer in a week or two. If you know when the spraying has occurred, and several rains and a couple of mowings have occurred since the spraying, the residue should be gone. Of course, grass clippings that have had no spray are the best.

Since sprouting in soil produces sprouts of higher nutritional value than sprouting with water only, what is the best kind of soil to use?

Seeds can be sprouted in soil, indoors or out. The sprouts will indeed be of higher nutritional value than the sprouts that are produced with the use of water only, especially if the soil is properly prepared. The soil should consist of one part fine compost, one part fine topsoil, and one part sand.

Is it best to wash the salt off of seaweed?

Organic Gardening magazine, March 1980, page 20, says that it really isn't necessary to wash the salt off of seaweed, as the amount of salt that might cling to the seaweed is minimal. Dig the fresh seaweed into the soil to avoid leaching out of nutrients that will occur if you allow it to heap up and decay. Organic Gardening says that seaweed is nutritionally similar to barnyard manure, except that it contains twice as much potassium. It is also high in iron and zinc, and contains some iodine.

What is "Diatomaceous Earth?"

It is composed of the fossilized shells of microscopic one-celled algae. It is a natural product, and kills insects mechanically. The shells break down into tiny, razor-sharp needles of silica, and the silica particles attack the wax coating that covers the insect. The insect gradually loses fluid and dies in about twelve hours. Diatamaceous earth is fine, dry dust, and is best applied when plants are wet, or it may be dissolved in water. In a five-gallon sprayer, place a teaspoon of liquid soap compound in a quart of warm water. Add one-fourth pound of diatomaceous earth, and top off with water. Keep solution agitated as you use it. Diatomaceous earth works against insects only when they are in their pupal, maggot, or grub stage. This substance can irritate your lungs, so wear a protective mask when using it. Don't use formulations which are mixed with pyrethrum and chemicals. If you can't find it locally, it can be ordered from Golden Harvest Organics.

What causes carrots to be bitter?

An insufficient or uneven supply of moisture or of nutrients will produce bitter carrots. Insects or disease can also cause bitterness. If you follow the instructions in this lesson, as to composting, mulching and watering, your carrots should be healthy and sweet.

Is it advisable to grow vegetables or trees over or near a septic tank?

Root vegetables and leafy crops can become contaminated if grown near a septic tank. The roots of trees can damage the drainage pipes. Shallow-rooted plants would be less of a problem, but there would still be some risk of infection from any food plants planted over or near a septic tank. It would be best to plant somewhere else.

Is soil-testing a foolproof method to determine the actual needs of the soil, or is one better off just feeding the soil with organic matter and thus building its fertility?

I grew many successful vegetable gardens without any soil testing. An article in the August 1982, *Organic Gardening* magazine ("Organic Discoveries," Jeff Cox, pp. 104-105) offers documentation of the fact that frequently these tests are relatively meaningless. Dr. William Liebhardt, Assistant Research Director at the Rodale Research Center, says that a reliable nitrogen soil test is just not available. Dr. Liebhardt sent the same soil to 69 major laboratories, and received analyses and fertilization recommendations that varied wildly. Measurements of organic matter varied almost as much as the nitrogen recommendations. The 69 laboratories' measurements of phosphorus, potassium and soil pH also fluctuated widely. Cox's opinion is the same as mine. Feed the soil, and let the soil feed the plants. He spoke with Dr. Roger Pennock, soil scientist at Penn State University, about the carbon-to-nitrogen ratio. Dr. Pennock said, "The end product of organic matter decay—soil humus—tends toward a perfect carbon-nitrogen ratio of ten to one. At this level, and up to about fifteen to one, nitrogen will be released to the plants as they need it." Finished compost has the 10 to one ratio, and is the perfect balanced fertilizer.

Article #1: Vegetable Preferences

	Compatible Neighbors	Incompatible Neighbors
Beans, bush	Potatoes, cucumbers, celery, corn, savory, strawberries	Garlic, onion family
Beans, pole	Corn, savory	Garlic, onion family, beet, cabbage family, kohlrabi, sunflowers
Beans, misc.	Potatoes, carrots, cucumbers, cabbage family, corn, eggplant, squash, rosemary, nasturtiums, petunias, savory	Garlic, onion family

Beets	Onions, kohlrabi	Pole beans
Cabbage family	Potatoes, celery, beets, nasturtiums, mint, dill, sage, tansy, thyme, rosemary, garlic, onion family, radishes	Pole beans, strawberries, tomatoes
Carrots	Peas, lettuce, onions, leeks, chives, tomatoes, rosemary, sage	Dill
Celery	Tomatoes, bush beans, cabbage family, leek	
Cucumbers	Beans, corn, peas, radishes. nasturtiums, sunflowers	Potatoes, aromatic herbs
Eggplant	Beans, potatoes	
Lettuce	Carrots, radishes, cucumbers, strawberries	
Melons	Radishes	
Peas	Carrots, turnips, radishes, cucumbers, corn, beans	Garlic, onion family, potatoes, gladiolus
Potatoes	Beans, corn, cabbage family, horseradish (at corners of patch), flax, eggplant, marigold, green beans	Squash, cucumbers, pumpkin, tomatoes, sunflowers, raspberries
Soybeans	Helps everything—plant near corn	No enemies
Squash	Corn, radishes, nasturtiums	
Strawberries	Bush beans, lettuce, spinach, borage	Cabbage family
Sunflowers	Cucumbers	Potatoes
Tomatoes	Carrots, sweet basil, mint, chives, onions, parsley, dill, marigolds, nasturtiums	Kohlrabi, potatoes, cabbage family, fennel, nut trees
Turnips	Peas, shallots, leeks	

Article #2: Companion Plants

Plant	Companions and Effects
Asparagus	Tomatoes, parsley, basil
Basil	Tomatoes (improves growth and flavor); repels flies and mosquitoes.
Beans	Potatoes, carrots, cucumbers, cauliflower, cabbage, summer savory, most other vegetables and herbs. Adds nitrogen to soil.
Beans(bush)	Sunflowers (beans like partial shade, sunflowers attract birds and bees), cucumbers (combination of heavy and light feeders), potatoes, corn, celery, summer savory.
Beets	Onions, kohlrabi.
Borage	Tomatoes (attracts bees, deters tomato worm, improves growth and flavor), squash, strawberries.
Cabbage family	Potatoes, celery, dill, chamomile, sage, thyme, mint, pennyroyal, rosemary, lavender, beets, onions. Aromatic plants deter cabbage worms.
Carrots	Peas, lettuce, chives, onions, leeks, rosemary, sage, tomatoes.
Catnip	Plant in borders; protects against flea beetles.
Celery	Leeks, tomatoes, bush beans, cauliflower, cabbage.
Chamomile	Cabbage, onions.
Chervil	Radishes (improves growth and flavor).
Chives	Carrots; plant around base of fruit trees to discourage insects from climbing trunk.
Corn	Potatoes, peas, beans, cucumbers, pumpkin, squash.
Cucumbers	Beans, corn, peas, radishes, sunflowers.
Dill	Cabbage (improves growth and health), carrots.

Eggplant	Beans
Fennel	Most plants dislike it.
Flax	Carrots, potatoes.
Garlic	Roses and raspberries (deters Japanese beetle); with herbs to enhance their production of essential oils; plant liberally throughout garden to deter pests (ex: near legumes).
Horseradish	Potatoes (deters potato beetle); around plum trees to discourage curculios.
Lamb's quarters	Nutritious edible weed; allow to grow in modest amounts in the corn.
Leek	Onions, celery, carrots.
Lettuce	Carrots and radishes (lettuce, carrots, and radishes make a strong companion team), strawberries, cucumbers.
Marigolds	The workhorse of pest deterrents. Keep soil free of nematodes; discourages many insects. Plant freely throughout garden.
Marjoram	Here and there in garden.
Mint	Cabbage family; tomatoes; deters cabbage moth. House fly repellent.
Mole plant	Deters moles and mice if planted here and there throughout the garden.
Nasturtium	Tomatoes, radishes, cabbage,, cucumbers, plant under fruit trees. Deters aphids and pest of cucurbits.
Onion	Beets, strawberries, tomatoes, lettuce (protects against slugs).
Parsley	Tomato, asparagus.
Peas	Squash (when squash follows peas up trellis). plus grows well with almost any vegetable; adds nitrogen to the soil.
Petunia	Protects beans; beneficial throughout garden.
Pigweed	Brings nutrients to topsoil; beneficial growing with potatoes, onions, and corn; keep well thinned.

Potato	Horseradish, beans, corn, cabbage, marigold, limas, eggplant (as trap crop for potato beetle).
Pot marigold	Helps tomato, but plant throughout garden as deterrent to asparagus beetle, tomato worm, and many other garden pests.
Pumpkin	Corn
Radish	Peas, nasturtium, lettuce, cucumbers; a general aid in repelling insects.
Rosemary	Carrots, beans, cabbage, sage; deters cabbage moth, bean beetles, and carrot fly.
Rue	Roses and raspberries; deters Japanese beetle. Keep it away from basil.
Sage	Rosemary, carrots, cabbage, peas, beans; deters some insects. Not with cucumbers.
Soybeans	Grows with anything; helps everything.
Spinach	Strawberries
Squash	Nasturtium, corn.
Strawberries	Bush beans, spinach, borage, lettuce-as a border.
Summer Savory	Beans, onions, Deters bean beetles.
Sunflower	Cucumbers
Tansy	Plant under fruit trees; deters pests of roses and raspberries; deters flying insects; also Japanese beetles, striped cucumber beetles, squash bugs; deters ants.
Tarragon	Good throughout garden.
Thyme	Here and there in garden; deters cabbage worm.
Tomato	Chives, onion, parsley, asparagus, marigold, nasturtium, carrot, limas.
Turnip	Peas
Valerian	Good anywhere in garden.
Wormwood	As a border, keeps animals from the garden.

Yarrow	Plant along borders, near paths, near aromatic herbs; enhances essential oil production of herbs.

Article #3: Nitrogen Fixation by John Tobe

Here is how nature provides nitrogen for plants in the soil.

Leguminous crops such as alfalfa, clover, etc., are probably, next to lightning, the most important sources of organic nitrogen.

While some of you may believe that the gods and nature have neglected the good earth and mankind, I want to assure you that this is not true.

It is fixed by natural phenomena and occurrence that all of the nitrogen required by the good earth is put into it by a simple, natural, trouble free way. It is only up to man to use it wisely.

It is my humble belief that the Lord did not ever intend mankind to do His work for Him. In truth, man is lucky if he can do his own work properly—never mind doing anything for the Lord.

Leguminous crops are properly established and divided through the entire earth's surface, including the deserts. This family not only contributes a wide range of forage plants but also plants used extensively for food, and, last but not least, as beautiful ornamentals. It consists of more than 430 genera and 10,000 species.

This family is probably one of the easiest of all to recognize because of the shape of the fruit which is invariably a legume or true pod, opening along tube sutures.

Many noted and respected authorities consider this family the most important family of plants in the horticultural world or any other world, says I!

When I talk to you about technical things, I can just feel I you drawing into that thick shell of yours so that you'll be impervious to my railing. But, says I, "How are you going to know and learn about nature's way if you don't listen?"

It is written that occasionally the road to knowledge gets a bit technical ... but bear up to it—there is much virtue and value therein.

The most important characteristic of this family is the fact all of them have roots or tubercles or nodules which certain soil microorganisms invade.

Here the bacteria obtains carbonaceous food from the plant and carries on the nitrogen fixation process, storing up the resulting nitrogeneous food material. This, if not used by the plant itself, is added to the soil when a plant dies and its roots decay ... thereby becoming available to other plants.

Invariably leguminous crops leave the soil in much better shape when they die than it was when they first started to grow. That is why clovers, soya beans, vetches and alfalfa are treated as cover crops or green manures because they positively and definitely, without additional cost, increase the nitrogen content of the soil—apart from adding humus.

I'll just name a few members of this family at random: the mimosa, acacia, genists cytisus, laburnum, wisteria, robina, lupinus, clover, alfalfa, beans, peas, vetch.

The way scientists would describe nitrogen fixation is as follows:

"Gaseous nitrogen diffusing into the soil from the air is converted into useable nitrogen by the mechanism of the leguminous plants, combined with the bacterial action of the microorganisms living in its roots. This act of conversion is what is known as nitrogen fixation and by this means nature provides simple nitrogen to the earth for its crops."

Therefore, not only is this plant able to secure the nitrogen it needs even when there is insufficient nitrogen in the soil ... but these legumes actually add to that supply and as far as nitrogen is concerned, leaves the land more fertile than before they grew.

Animal manures are invariably rich in nitrogen and the reason is very simple and obvious ... because animal fare and forage is often heavy in leguminous crops and they contain large quantities of nitrogen.

There is one important factor that should 'interest horticulturists about this family and that is that the flowers are invariably very showy and some of our most important trees, shrubs and vines belong to this group.

Commit this to memory...this family of plants has the rare ability to absorb free nitrogen from the air.

While back more than 2,000 years ago they did not perhaps know what we know, and this is that these plants provided the much needed nitrogen to the soil, the Romans used them extensively for soil improvement.

John Tobe is deceased, and "The Provoker," his publication in which this article appeared, is defunct.

Article #4: pH Preferences Of Some Plants

The chemical symbol "pH" is used to indicate acidity or alkalinity. On a scale of 0 to 14, pH values from 0 to 7 indicate acidity; values from 7 to 14 indicate alkalinity; pH 7, the value for pure water, is regarded as neutral.

Quite Acid (4 to 5)

Azalea	Holly
Gardenia	Ixora

Moderately Acid (5 to 6)

Fern	Pine
Orchid	Potato
Parsnip	Pumpkin

Persimmon, Japanese	Watermelon

Acid. Near Neutral (6 1/2 to 7)

Beet	Kale
Broccoli	Leek
Cantaloupe	Lima Bean
Chives	Marigold
Corn	Onion
Cucumber	Pea
Eggplant	Peach
Endive	Radish

Slightly Acid (6 to 6 1/2)

Allamanda	Oyster Plant
Avocado	Palm
Banana	Papaya
Bean Bottlebrush	Pecan
Citrus	Pepper
Copper	Philodendron
Croton	Pineapple
Dracena	Pittosporum
Fig	Poinsettia

Grape	Powderpuff
Gloxinia	Schefflera
Hibiscus	Shrimp-plant
Jasmine	Squash
Live Oak	Strawberry
Loquat	Tomato
Mango	Turnip
	Rutabaga

Alkaline, Near Neutral (7 to 7 1/2)

Alfalfa	Geranium
Cabbage	Lettuce
Carrot	Nasturium
Cauliflower	Petunia
Celery	Sweet Pea

The following is a partial list of available materials for "sheet composting" or compost piles, with some of their percentages of nitrogen, phosphorus, and potash:

	% of Nitrogen	% of Phosphorus	% of Potash
Activated Sewage Sludge	4.00-6.00		
Banana Skins		3.25	41.76
Blood Meal	7.00-15.00		
Bone Meal (Also contains potash and calcium)	5.00	22.00-35.00	
Cantaloupe Rind		9.77	12.21

Coffee Grounds	2.08	.32	.28
Corncobs			50.00
Corn Stalks and Leaves	.30	.13	.33
Cottonseed Meal (May increase acidity of soil)	6.00-9.00		
Crabgrass, green	.66	.19	.71
Fish Scraps, Fish Meal, Fish Emulsion (May have pleasant odor)	2.00-10.00	1.50-8.00	
Granite Dust			8.00
Grapefruit Skins		3.58	30.60
Human Hair Clippings (Get from Barber Shop)	16.00-18.00		
Manure	3.00-4.00		
Oak Leaves	.80	.35	.15
Orange Culls	.20	.13	.21
Phosphate Rock		30.00	
Pine Needles	.46	.12	.03
Tea Grounds	4.15	.62	.40
Wood Ashes		1.00	4.00-10.00

Article #5: Dirt Cheap? Nonsense! It's Vital to Garden

"As common as dirt!" "Dirt Cheap!" How many times have you heard those phrases? How many times have you watched an angry baseball manager bestow the ultimate humiliation upon a resolute umpire by kicking dust on his shoes?

In plain fact, the popular public image of dirt-dust-earth-mud-soil remains largely negative. In sharp contrast, all who have had more than a passing interest in planting and nurturing trees, shrubs, and food plants—centuries of professional farmers tilling millions of rolling rural acres and urban pot-bound house plant enthusiasts alike—have learned to place a high value on that vital, life-supporting medium, soil.

"Common?" Far from it! It can be as variable and complex as life itself. "Cheap?" Hardly! Placed in the proper perspective of materials most necessary to survival on this planet, soil becomes precious. Precious, yet misunderstood.

Soil is living and constantly changing material. It acts as a medium to hold the raw materials which trees and plants take up into their leaves and convert into food for their use through a process called photosynthesis. To function best, a soil should be made up of 45 percent mineral particles from disintegrated rock such as basalt, granite, sandstone or limestone; 5 percent humus from decaying organic matter; 25 percent water; 25 percent air; and a sprinkling of microscopic plant and animal life.

In general, basalt and granite-derived soils are shallow and tend not to be as rich as soils from sandstone and limestone parentage.

Sandstone-based soils are light, porous, have good aeration and are of medium fertility. Soils from limestone are high in clay, therefore heavy, usually poor in water and air content but can be fertile enough for trees. Most essential elements are present in large amounts in all soil, but the lack of one or more can result in poor tree and plant growth.

The ideal combination of ingredients in the right percentages occurs naturally in only a few fortunate places in the world.

Most people must start with the type and quality of soil that exists where they live. If it needs improvement they must gradually work with it, helping to move it closer to the ideal through the addition of sand, clay, or humus as individual conditions require.

A fairly deep hole dug in the yard, perhaps in preparation for planting a tree or shrub, will reveal soil layers of varying thicknesses. These may be noted as a visible change in color, structure or texture. The uppermost layer, the topsoil, should break up easily in the hand, yet feel slightly moist.

Topsoil does not have to be black in color to be a fertile medium for plants. The color as well as the fertility of a soil derives in part from the parent rock material that formed the soil and in part from the climate and other conditions under which it has been existing for milleniums.

Below the topsoil lies the first layer of subsoil. Often this is a hard ledge of material difficult to spade through. This accumulation of very fine iron particles or clay leached through from the topsoil above is called "hardpan" or "claypan." The National Arborist Association advises that this concrete-like layer can become impervious to the penetration of air, water, or even tree roots to the next layer of subsoil below, severely hampering normal, healthy tree development.

Heavily traveled areas of yard or garden otherwise having good soil texture may become sufficiently trampled so that the soil's structure is lost and air and water spaces are not large enough for root penetration. This condition is called "compaction." Simple cultivation will resolve the problem.

In these days of fast-rising developments and a new home construction a purchaser may be lucky or

unlucky in what the developer leaves him for topsoil. It can range from rich to poor to none! In rare cases the topsoil may be completely,skimmed off the property, leaving the unsuspecting but hopeful gardener with a severe problem. Occasionally, the topsil may have been trucked in from a distance and be far richer than the topsoil natural to the immediate area.

All trees and shrubs, however, do not find all types of soil to their liking, though one might assume they would if quoting the, line from Joyce Kilmer's classic poem "Trees." "A tree whose hungry mouth is pressed against the earth's sweet flowing breast..."

But plants definitely do have preferences.

To avoid an unhappy union consult an expert, perhaps a local arborist, whose knowledge of both soil characteristics and individual tree needs will permit him to recommend a variety of trees that will find your particular soil "sweet flowing."

Reprinted from St. Petersburg Independent, September 17, 1976

Article #6: Soil Test Secret To Success by Gene Austin

The home gardener or landscaper is at a disadvantage unless he or she has, literally, done the groundwork.

That means fortifying and building up the planting soil with humus such as compost and peat moss and with the essential elements nitrogen, phosphorus and potassium, found in commercial fertilizers.

But the landscaper who wants to get the most out of those expensive trees and shrubs also will investigate whether the soil needs treatment for alkalinity or excess acidity—or whether, in some cases, he needs new soil.

Those $2 words, alkalinity and acidity, and the related symbol, pH (hydrogen ion activity), place this story in peril of sounding like a high-school chemistry course, so "sweet" is hereby substituted for alkalinity, "sour" for acidity and pH is discarded, except to note that soil is measured on a pH scale and if your soil scores 7 on that scale, it's neutral.

Many well-meaning gardeners apply regular doses of ground limestone—a sweetener—to their lawns and gardens, in the belief that it will improve the soil. Unless the soil is fairly sour, it actually may be detrimental, since most plants grow best in a slightly sour or neutral soil.

A soil test is the way out of this dilemma, and is particularly important where major landscaping projects — such as a new lawn or a large vegetable or flower garden—are contemplated. In the case of these big projects, bringing in new topsoil may be a lot cheaper and easier than attempting to improve poor soil with additives.

Complete soil testing can be a do-it-yourself job. Kits are available for a few dollars but good ones are in the $20 to $50 range. The easiest way is to use the expert and inexpensive services of the Agricultural Extension Service in your county.

To get the most out of soil testing, and remove much of the element of chance from landscaping and gardening, several samples should be taken—one in the vegetable garden, a sample from a couple of points in the lawn, one from the area where fruit trees are grown, etc. Since testing is usually necessary only every four or five years, the cost is a real bargain.

Ground limestone—never slaked lime or quicklime—is used to correct sourness in soil and aluminum

sulphate or sulphur to reduce sweetness. Soil testing, however, also will determine the correct fertilizing needs in terms of nitrogen, phosphorus and potassium. The payoff here may be in hard cash as well as better plants, since either too much or the wrong kind of expensive fertilizer may be being used by haphazard gardeners.

While 5-10-5 (the numbers indicate the percentage of nitrogen, phosphorus and potash) is a good general fertilizer for many plants, lawns may require something much higher in nitrogen, such as a 24-4-4 formula. But only a complete soil test can determine the correct formula for a particular area.

If most of your plants are doing well and the complete test sounds like too much trouble, you can conduct a simple checkup for a few cents by buying a piece of neutral litmus paper at a drugstore. Press a bit of the paper against some moist soil after a rain—if the paper doesn't change color, the soil is neutral; if the paper turns blue, the soil is sweet; if it turns pink, sour.

Knight News

Article #7: Pesticides—They're Killing Bugs—and the Land by Ronald Kotulak

DENVER, Colo. — Millions of tons of chemicals dumped on plants to kill pests and germs contain heavy metals that are permanently destroying the productivity of the land, a federal agricultural scientist warned Monday.

The threat from the heavy metals has not been recognized before because little has been known about plant mineral nutrition, said Dr. John C. Brown, a soil scientist at the United States Department of Agriculture's plant stress laboratory in Beltsville, Md.

New research has disclosed that heavy metals such as copper, zinc, molybdenum and boron block a plant's ability to absorb iron from the soil, he reported at the annual meeting of the American Association for the Advancement of Science.

Iron is the single most important nutrient for plants. It is essential for the formation of chlorophyll.

"Based on our knowledge, we view this as a serious threat. The whole of agriculture is threatened," Brown said.

"If we don't stop the use of heavy metals, in 30 to 40 years from now we will destroy some of our most productive farmland," he added.

The danger from heavy metals already is showing up, he said. Citrus trees in Florida are suffering growth problems because the soil in many areas has been saturated with a fungicide containing copper sulfate.

In many areas of South Carolina, farmers are having difficulty growing cotton because of the widespread use of a bacteriacide containing zinc, he said.

Michigan farmers are having trouble with soybean because of high phosphate levels in the soil and in the Pacific Northwest chemicals containing arsenic added to the soil to kill pests are hampering plant growth, Brown said.

Once in the soil the heavy metals last indefinitely, permanently destroying the productivity of the land. Without adequate amounts of iron, the fruits of the plants are nutritionally deficient and the plants eventually die.

"The thing that bothers me is that we are still adding things to the soil that contain the heavy metals," he said. "If we don't stop it, we will have nothing left."

Most of the compounds are added to the soils without any basic understanding of how they affect the mineral nutrition of plants, which scientists only now are beginning to understand, Brown said.

We are not set up in agriculture to know what we are doing. We need to know what we are adding to the soil and how the soil is affected," he said.

Millions of dollars are being spent to develop methods of placing treated sewage on farmlands to increase their yield, said Brown. But the sewage contains high levels of heavy metals which eventually would make that farmland unproductive, he explained.

The Department of Agriculture needs more money so that it can establish regional laboratories that can analyze soils, plants and compounds intended to be added to the soil to avoid the danger of making the soils poisonous from heavy metals, he said.

Chicago Tribune

Article #8: Pesticides—There Are Workable Alternatives To the Dusts, Sprays, and Oils by Joan Jackson

If there is a secret to garden defense, it is common sense. There are no easy answers about what is right —or best—to use in that defense.

While the pesticide-environment battle goes on, the backyard gardener fights his own private war, sometimes in unorthodox ways, to save his crops from insects and diseases.

Is there a happy medium between the shotgun gardener who tries to do too much and bombards his plants with dusts, sprays and oils at the first sign of invasion, and the purist who establishes his garden and then refuses to use any chemical means to protect it?

There are good pesticides—and bad ones. And there are alternatives that work—and ones that fail. A smart gardener weighs them all, experiments with some, and uses what works best.

The beneficial ladybug is probably the best known insect in the garden. This little beetle has done wonders for making poison-free gardening possible.

How do you keep your ladybugs from doing the "flyaway-home" routine? They will only stick around if there is enough to eat. You probably won't need ladybugs until summer, when the pest problem is at its worse.

Water your garden then in the early evening, carefully place a container of ladybugs about 15 to 20 paces apart at the base of the plant. In the morning, they will begin climbing the plants and sampling the insects (aphids are a favorite—one ladybug will eat 50 aphids for breakfast).

For the average backyard garden, one container of ladybugs should be enough. Where to find them? In the summer, they are sold commercially through garden supply stores.

Invite a creature into your garden. A toad or a frog, for instance, is a good friend to the gardener. Ninety percent of a toad's food consists of insects, most of which are harmful to the garden.

To encourage a toad to stick around, provide a modest shelter so it can rest out of the sun. Cut a small

entrance in a box or chip in an opening in the side of a flower pot, and bury it a few inches into the ground, preferably in the shade. You might even provide a shallow watering hole-pond; if not keep the shrubbery around your Toad Hotel damp.

Some people may feel squeamish about it, but picking off bugs by hand is a perfectly logical solution. If you squash or rub off pests as soon as you notice them, you may not need a pesticide later on.

Remember, many insects come and go with the season, and will come and go with little damage to your garden if you just let them alone.

If aphids are bugging you, give them a bath. A strong squirt of water will wash them off leaves; or you can rub them off by hand. Still got aphids? Then try a soap bath. Make a strong solution of soap—not detergent—(Ivory Flakes, for example) and water using three tablespoons of soap flakes to a gallon of tepid water.

Use your hose and sprayer to cover the infected plant with suds, wait a few hours, and then wash the plant off with plain water.

Lo, the beautiful marigold. It should be freely inter-planted with vegetables because of its pest-repellent properties. The gardeners say the French marigold and the tall odored American marigold seem to discourage many garden pests, especially nematodes and rabbits.

The marigolds exude substances from the roots which will rid the garden of nematodes if planted each year. The ones with the strongest odor are the most effective and have been reported to repel pests ranging from bean beetles to rabbits.

You could write a book about ways to get rid of snails—and you'd still have snails.

One way is to "go looking" for them late at night—about 10 p.m.—with a flashlight. Hand pick them and dispose of them.

Snails also are supposed to be beer lovers. All'you need is a pie pan and some old beer. Make a depression in the ground and set the pan in it, so that the rim of the pan is even with the soil. Fill the pan with stale beer (that's the secret—the stale beer). The snails will crawl in and drown in the brew. Change the beer every few days.

Why is it that some gardens are plagued by a hungry horde of insects and others remain clean and bug-free? In gardening, an ounce of prevention is worth the time. The rules are simple:

- Keep your garden healthy without poisons by shaping up the soil with amendments and nutrients.
- Get rid of plants that are damaged by pests or are sick.
- Use seeds and plants that are disease or pest resistant varieties.
- Keep it clean. Rake up leaves and toss out fallen fruit and dead flowers.
- Water and fertilize regularly. It is part of the "keep 'em healthy" routine.
- Keep after the weeds. They offer a comfortable home for insects. For the same reason, the ground should be cleared of all crops once harvesting is completed.

Knight-Ridder Newspapers

Article #9: Containing Inhibits 'Raiders' By Gene Austin

Home vegetable gardens are the targets of all sorts of four-footed and winged raiders, and everything

from beagles to buckshot has been tried at one time or another in the effort to foil them.

One reader, F. Thalken of Vineland, N.J., writes that last year rabbits ate everything in the family garden but the tomatoes, and equally plaintive tales are heard from others.

Except for a few animals that seem to defy all reasonable restraints—notably groundhogs, skunks and raccoons—fencing the garden or the parts of it containing the most vulnerable plants remains the surest solution.

Before discussing quick and inexpensive ways to fence, however, note should be taken of the various chemical and natural nostrums concocted in the battles against marauding animals and birds.

Mellinger's, a firm that advertises "1,000 horticultural items" and is located at 2310 W. South Range, North Lima, Ohio 44452, in case anyone wants to write for a catalog, devotes an entire page in its current sales book to such items as Squirrel Skram, K-Pels to protect shrubs from dogs, dog and cat repellant spray bombs, Roost No More to keep pigeons and starling away, rabbit and deer repellent, mole killer and snail and slug pellets. Try them at your own risk.

One gardener swears by a substance more readily available: cayenne pepper. Sprinkled lightly on rows while plants are small, it is supposed to solve the rabbit problem. Once plants have passed the tender stage they are not as attractive to rabbits.

A spray made of nicotine sulphate (2 teaspoons of 40 percent nicotine sulphate per gallon of water) is supposed to repel rabbits, if a garden supply dealer who stocks the chemical can be found.

Various plants also have been arrayed in the battle. Soybeans, planted all around the edge of a garden, are said to be so attractive to rabbits that the bunnies will touch nothing else. Wormwood, a smelly plant that some gardeners place throughout their plots, is supposed to deter raids by rabbits, groundhogs, raccoons and other freeloaders.

My own garden is located less than 200 feet from a wooded area with a full quota of wildlife, but I've been able to protect the vegetables adequately with temporary fences and other wire restraints. I also subscribe to the theory that fencing an entire garden is needless and expensive since many plants don't need protection.

Experience will have to be the guide in your area, but my own observation is that the plants most likely to be raided are young peas or seedlings of squash, melons, cucumbers, sunflowers and similar plants with large, edible seeds; corn when it becomes ripe; and ripe melons.

Corn and some large seeds often are victimized by crows and other birds, who will fish out seeds or pull up plants when they are only a few inches tall.

Plastic-coated fencing in the 48-inch size, or 24-inch if you can find it, makes fine protection for young plants and seedlings, including peas and beans, and just-planted corn and other vulnerable seeds.

The 48-inch fencing is cut into 24-inch wide strips about 6 feet long and bent down the middle to form a wire tent that will allow the plants to reach a safe size. The strips are easily stored in a small space by stacking them one on top of the other.

Temporary fences made of 24-inch chicken wire will protect larger bush beans and peas and also will help support the plants if you have only a couple of rows. Stakes cut for 2 or 3s and sharpened with a saw or hatchet will hold the fence, which can be put up in minutes with a stapling gun and disassembled just as quickly and rolled for storage.

Fences admittedly make cultivation of plants difficult, but if dried lawn grass is used for mulch between rows and around the plants, no cultivation will be needed.

Cages can be formed of pieces of chicken wire to protect melons when they near the ripe stage but ripe corn presents special problems. I have found stalks, chopped off near the ground and toppled and nothing but cobs left where the ears had been.

I've heard of one gardener who ties the tops of his cornstalks together with nylon fishline; when the maurader chews through the base of the stalk it doesn't fall and the animal departs, too discouraged to return (or so I'm told). I prefer to pick the corn as soon as it ripens and to write off any losses as philosophically as possible.

Fending off stray dogs and other pets may be the biggest problem with roses and shrubs. To protect them, make circles of 12-inch or 18-inch plastic-coated wire fencing. The circles should be approximately the same diameter as the shrub.

A simple way to get the right size circle is to measure or estimate the width of the shrub, then cut a piece of fencing 3 1/2 times that long. Hook the ends together by bending the wire ends together with pliers—the circle should slip down over the shrub and is easily removed for weeding or other work. Even cats don't seem interested in getting inside these circles.

If traps are resorted to, I recommend the box variety that doesn't injure the animal, which should subsequently be released in a woodland, not a residential area.

Knight Newspapers